Distr.
LIMITED

IPCT.49
19 November 1987

ENGLISH

UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

Joint UNIDO/UNESCO/KIER (Korean Institute of Energy and Resources) Workshop on Information Network for New and Renewable Sources of Energy and Energy Conservation in Small and Medium Industries of Asia and the Pacific Region

26-31 October 1987, Daejeon, Republic of Korea

R E P O R T*

---

* This document has been reproduced without formal editing.

V.87-91885

TABLE OF CONTENTS

		Page
I.	Recommendations	1
II.	Introduction	4
III.	Presentation of Country Papers	10
IV.	Discussion	23
V.	Adoption of Report	24
VI.	Acknowledgement	24
VII.	Annexures	
	I. List of Participants and Observers	25
	II. Work Programme	34
	III. List of Documents and Country Reports	36

I. RECOMMENDATIONS

1. UNIDO/AEN (Asian Industrial Energy Information Network) should collect case studies on NRSE and energy conservation in industries and make them available to INNERTAP (Information Network on New and Renewable Energy Resources and Technologies for Asia and the Pacific) and others. INNERTAP should continue to collect information on NRSE and energy conservation and make the database available also to AEN.

2. It is recommended that UNIDO in consultation with ESCAP/REDP should organize a regional consultation meeting on policies, programmes, and institutional arrangements needed for effective implementation of activities concerning NRSE and energy conservation in small and medium industries in Asia/Pacific region every two (2) years and make the reports and other materials arising from these activities available to INNERTAP.

3. In order to up-date the knowledge of developing countries of the Asia/Pacific region on available technologies in the utilization of NRSE and energy conservation in small and medium industries, it is recommended that UNIDO organize workshops, seminars, training programmes and advisory missions and make the reports available to INNERTAP NFPs and Member States for further dissemination to interested users.

4. Taking advantage of the availability of modern computerized databases, improved and instant telecommunication services and the possibility of linking mini computers in different countries, time has come to install on-line data retrieval and dissemination systems at least in focal points in some countries in the Asia/Pacific region. UNIDO is requested to immediately proceed with the installation of such systems in selected countries in the Region on experimental basis.

5. In view of the pressing need to disseminate information on NRSE and energy conservation technologies relevant to rural development, for example, cooking stoves, small producer gas generators, biogas generation and its use, etc., it is recommended that UNESCO/INNERTAP and UNIDO/AEN should coordinate efforts in producing appropriate information packages for wide dissemination to rural areas in the region.

6. It is recommended that countries of the region should intensify demonstration and extension activities to make available to the actual users knowledge on NRSE and energy conservation technologies.

7. It is recommended that UNIDO and UNESCO should make available resources to further strengthen the information handling capabilities of Member States in the region through organization of training workshops, provision of micro-computers, modems, CD-ROMs, etc.

8. R&D institutions in the Asia-Pacific region active on NRSE and energy conservation should itensify exchange of R&D information and experience in commercialization among themselves. For this purpose, it is recommended that UNIDO should extend needed support to appropriate institutions for commercializing R&D results of NRSE and energy conservation technologies.

9. R&D institutions in the region should actively explore possibilities of conducting joing R&D programmes, and demonstration projects with the assistance from UNIDO.

10. Member States are to strengthen technically and financially existing institutions engaged in information collection and dissemination activities in NRSE and energy conservation to improve information flow and use in the Member States and in the region.

11. It is recommended that UNIDO/UNESCO organize study tours for experts from Member States to observe operational projects/activities in NRSE and energy conservation.

12. It is recommended that UNIDO/UNESCO allocate funds to commission state-of-the-art studies in the development and use of NRSE and energy conservation technologies in specific industrial and other application areas.

13. It is recommended that the Regional Network for Small Hydro Power (RN-SHP), as represented, consider to utilize the INNERTAP as their information facility to collect, process and disseminate information pertaining to SHP.

II. INTRODUCTION

Background Information

One of the functions of UNIDO is to serve as a clearing-house for industrial information and accordingly collect and monitor, on a selective basis, and analyse and generate for the purpose of dissemination information on all aspects of industrial development on global, regional and national, basis as well as on sectoral levels including the exchange of experience and technological achievements of the industrially developed and the developing countries with different social and economic systems.

The fourth Steering Committee Meeting of INNERTAP in Beijing, October 1986, asked for a joint UNIDO/UNESCO meeting on energy information field.

The Committee further recommended that countries utilize advanced telecommunications facilities such as electronic mailing, teleconferencing, etc. for more efficient and effective exchange of information in the energy sector.

In reviewing SMIs energy information field in the Asia and the Pacific region within the context of their overall industrialization efforts, the subject of energy information network became increasingly highlighted, particularly because each country had different experiences in this field. Therefore, it was recognized to countries that they should exchange such experiences since the application of more energy efficient technologies for process and product engineering became one of the most important concerns of membere countries in the Region.

In a number of developing countries of the Region, the application of such technologies to SMIs had been successfully practiced in a number of manufacturing sectors through national energy policies as well as intensive research and development, transfer of energy efficient technologies and information exchange.

It was considered, therefore, to be of great interest to some countries to exchange such practical experiences, including the activities of National Energy Centres. Recognizing the importance of the subject, UNIDO, UNESCO and KIER agreed to provide an opportunity to exchange such experiences and information among developing countries of the Region.

While reviewing plant-level energy conservation in ASEAN countries within the context of their overall national energy conservation efforts, the subject of network concept on ASEAN energy information, including energy conservation information had become increasingly highlighted, particularly each country of ASEAN group had different national policies on energy conservation, different mechanisms of energy auditing and different experiences.

ASEAN Energy Information Network was organised, as asequel to UNIDO "Expert Group Meeting on Exchange of Experiences on Energy Conservation in Small and Medium Industries for ASEAN Countries" held in Kuala Lumpur, 5-7 December 1983. The meeting recommended the formation of ASEAN Energy Information Network for SMI. In this connection, a staff member of UNIDO/INTIB visited ASEAN countries in April 1986 in order to discuss with relevant Government authorities of ASEAN countries, institutions and organizations, and formulate ASEAN Information Network on Industrial Fnergy Conservation as well as New and Renewable Sources of Energy as sub-network of industrial and technological information bank (INTIB).

Through the network the following consolidation actions were envisaged:

- Information exchange through industrial inquiry service on

  - o National energy policies and planning
  - o Activities of national energy centres
  - o Energy efficient technologies as well as equipment
  - o Experiences on energy training courses
  - o On-going energy related research and development

- Training workshops on

  - o Energy management
  - o Energy auditing
  - o Energy cost analysis with personal computer

- Advisory services on

  - o Establishment and improvement of national energy centre
  - o National energy information policy formulation
  - o Plant level energy conservation
  - o National energy conservation law and regulations

- Appliance testing services

Objectives

The objectives of the workshop were as follow:

1. To exchange experiences on application of NRSE/energy conservation technologies to SMIs.

2. To promote a computerized energy information system so as to provide SMIs with accurate, timely and adequate information on sectoral energy efficient technologies, equipments, engineering design, other energy related matters.

3. To formulate joint UNIDO/UNESCO energy programmes and projects related to industrial and technological information field.

Organization

The joint workshop was attended by 38 participants and observers from seven countries and four representatives from UNIDO and UNESCO participated. The list of participants and observers is at as Annexure I. Program of the Workshop is at Annexure II.

In the morning of October 26, 1987, the Workshop was inaugurated. Dr. IK-SOO CHOI, Acting President of Korea Institute of Energy and Resources welcomed the participants to the Workshop. He thanked UNIDO and UNESCO for organizing this Workshop in Daejeon with assistance from KIER. Dr. IK-SOO CHOI briefly mentioned the activities in Korea in the area of NRSE and energy conservation. He hoped that more intensified effort would be made by UNIDO and UNESCO and the information networks established by UNESCO and UNIDO to promote information collection and dissemination in this important area of interest to countries in the Asia-Pacific region would activate greater successes in the future.

Mr. SOO-KIL YOON, Director General, Resources Development Bureau, Ministry of Energy and Resources, Republic of Korea, welcomed the participants to the workshop and congratulated UNIDO/UNESCO and KIER for organizing this important Workshop. He emphasized that the Workshop develop a cooperative mechanism for mutual exchange of information on NRSE and industrial energy conservation.

Mr. CHI-MOOM KIM, Research Coordinator, for Energy and Resources Technology, Ministry of Science and Technology, Republic of Korea, also welcomed the participants to the Workshop and briefly described the research efforts being made in Korea to reduce consumption of industrial energy, development of alternative energy sources like coal and NRSE. He wished the Workshop all success.

Dr. H.W. PACK, Senior Officer, United Nations Industrial Development Organization described the establishment of Industrial and Technological Information Bank (INTIB) as a follow-up of the Lima Declaration and Plan of Action. He mentioned about the activities of INTIB to facilitate and accelerate flow of information to INTIB users for the proper selection of technology and equipment in selected industrial sectors. Dr. PACK mentioned about the possibilities of using modern electronic and computer based facilities for gathering and making available to users information required at very modest cost.

The Fourth Steering Committee meeting of INNERTAP held in Beijing during October 1986, recommended a joint UNIDO/UNESCO meeting in the energy field. Dr. PACK hoped that the present Workshop will strengthen network activities in the Asia-Pacific Region for accelerated flow of information in NRSE and energy conservation in small and medium industries in the Region. Dr. PACK described the energy related technical assistance that are available from UNIDO. He wished all success to the workshop.

Dr. U.S. KURUPPU, Program Specialist, ROSTEEA, UNESCO, expressed his happiness that it had been possible to organize a Joint UNIDO/UNESCO Workshop with host facilities provided by KIER. He described the activities of the UNESCO in the information field related to NRSE and energy conservation. This Program has three elements: 1) to encourage and promote research and development on alternative sources of energy; 2) to provide training of personnel; 3) to establish a global network of energy information called Energy Information Program. As part of this programme UNESCO promoted the establishment of the Information Network of New and Renewable Energy Sources and Technologies for Asia and the Pacific (INNERTAP), primarily for non-commonwealth nations, in order to avoid duplication of work. Dr. KURUPPU described the UNESCO energy programme. He wished the Workshop success.

Election of Officers

The Workshop elected the following officers

1.	Chairman	Dr. PAUL C. AUH Director of Solar Energy, KIER Korea
2.	Vice-Chairman	Mr. ZHAO YING-FU Division Chief International Relations, ISTIC Peoples Republic of China
3.	Rapporteur	Mr. CHARLIE A. QUIRANTE Sr. Mechanical/Electrical Engineer Conservation Division Office of Energy Affairs Philippines
4.	Assistant Rapporteur	Mr. ROGELIO Z. ALDOVER Department Head Program Management and Information Dept. PNOC - ERDC Philippines

III. PRESENTATION OF COUNTRY PAPERS

Then the Workshop proceeded with the presentation of country papers. The list of country papers is at Annexure III, summaries of Papers presented follow:

A. Energy Conservation

PHILIPPINES

Energy conservation was recognized as an essential component of the Government's energy policy. The thrust of the Government's energy conservation programme was directed towards improving energy use in the industrial, transport and commercial sectors, the largest energy consumers of the country.

The Office of Energy Affairs through its Conservation Division conducted training programmes, seminars and energy conservation briefings to all sectors. About 3,000 participated in these programmes. The Agency produced a number of energy management publications, energy conservation booklets, manuals and journals and distributed them to different sectors.

The Office also gives consultancy and project engineering services to industry. It provided energy audits to 245 industrial and commercial establishments and project engineering to two industrial plants which identified total potential annual savings of 203 million liters of fuel oil equivalent of energy or US $32 million of foreign exchange. Industry energy efficency monitoring was also undertaken to establish an industry data base.

Presently, the energy conservation activities were moving towards small and medium industries in the country.

PEOPLE'S REPUBLIC OF CHINA

China's township enterprises belong to the class of small scale enterprises. The development of township enterprises was changing the Chinese economic situation, specially in the rural areas. According to statistics available, there were 6.06 million township enterprises in 1985, employing 69.8 million people with 272.8 billion yuan (about US $73.6 billion) gross output value. It was 7% of the Chinese total industrial and agricultural output value and 44% of the total rural output.

The paper described a number of characteristics of the China's township enterprises. The Chinese Government devoted much attention to the development of township enterprises. In 1985 the State Science and Technology Commission of China launched "Sparks Programme" to mobilize scientists and technologists to give support to the development of township enterprises.

The paper also discussed worrisome problems of township enterprises which needed to be promptly solved. The paper mentioned about the present situation of energy utilization in China's township enterprises and the great potential for energy conservation in those enterprises. For instance:

1. Strengthening and improving energy management
2. Restructuring the local product and economy
3. Upgrading the technologies used in SMIs

Detailed description of methods of energy conservation were also described in the paper.

THAILAND

By the end of 1986, energy consumption in industry was about 6184 mmleoe or 28% of national energy consumption. The policy framework for stimulating and implementing energy conservation programme during the present national economic and social development plan (1987-1991) was to reduce dependence on energy imports and diversify both sources of supply and type of energy, and to promote energy saving activities and its efficient use. The on-going activities and plans for energy conservation could be summarized as follows:

1. Since the Fifth Five-Year Plan, the Government energy conservation unit was set up within N.E.A. (National Energy Authority) to provide free of charge service to individual factories.

2. The National Energy Conservation center (NECC) under the N.E.A.'s supervision had been established and its operations commenced during October 1986.

3. The drafting of energy management law, to promote ans strengthen other efficient energy activities had been completed and been sent to the Government.

4. The Government reduced import duty from 30% to 10% for machinery and equipment needed for energy saving.

5. For demonstration program, N.E.A. provided loan to selected factories at a concessional annual interest rate of 10%.

6. As incentive for efficient use of electricity, bonus to factory having machinery consuming over 0.85 electricity power factor was granted.

For providing further cooperation, and exchanging of energy conservation information among countries, conferences, seminars, inspection tours and training courses are recommended to UNIDO/UNESCO.

MALAYSIA

Malaysia was relateively rich in its energy resources, There was also a large potential for energy conservation in the manufacturing sector. Malaysian industry consisted of a small number of large firms accounting for a major share of industrial production and a large number of medium and small sized firms which were typically Malaysian and engaged in production activities based on less sophisticated technologies. There were notmany industries with high to very high specific energy consumption. Most industries belonged to medium to very low specific energy consumption. Large firms with expertise from their parent companies from abroad implemented energy conservation measures to a reasonable level. It was the small and medium scale industries that needed databases, information and institutional support.

The envisaged information network could be a reliable channel to provide the database applicable in the region, which could in turn be used for the development of energy conservation programmes and the implementation tools on a continuous basis.

INDONESIA

In Indonesia, oil representing about 70% of energy mix had to play two roles: to meet energy demand and to earn foreign exchange. Industrial sector offered a large opportunity for energy saving programme. At planning level, Directorate General of Electric Power and new Energy was responsible for energy conservation programmes. The Directorate General had initiated and would continue to undertake various promotional activities in the field of energy conservation including energy audit, training and information dissemination, etc.

In order to extend energy conservation activities up to implementation stage, an energy conservation corporation had recently been established. This semi private corporation, called PT. Koneba, obtained technical guidance from the Directorate General of Electric Power and New Energy. The establishment of the ECC indicated furthr commitment from Government's towards energy conservation programme to make the substantial potential saving a reality.

To increase the knowledge of persons at plant level, an external assistance was needed, especially to make information of energy conservation techniques available. Joint programmes with UNIDO and UNESCO could be formulated and suggested taking into account experiences gained so far. This cooperation could be in the form of training, dissemination of information, seminars and provision of equipment to facilitate information networks.

KOREA

Energy consumption in Korea was expected to grow continuously and the dependence on foreign energy resources would gradually rise to over 80% by 1991. Due energy diversification policy, the sharing of oil in the total energy important would drop while nuclear and gas energies would be major substitutes for oil.

The goal of energy consumption per gross national production was expected to decrease about 10% by 1991 compared with current level. Energy efficient facilities and new technologies would be continuously adopted and manufacturing processes would be modified to ensure energy efficiency. Particularly, intense attention will be given to small and medium industries. Continuous efforts should be put into find and identify energy conservation potentials and develop new energy conservation technologies.

This paper also included a brief introduction to energy conservation programmes, institutional set-ups, Government's financial assistance and incentives in Korea.

INDIA *

India had been very active in the field of NRSE and energy conservation in small and medium scale industrial sectors. The small scale sector forms a very large part of the total industrial sector, 1.4 million small industrial units, manufacturing about 5,000 items and contricuting 22% to national exports. The Small Industries Development Organization (SIDO) in the Government of India was currently engaged in a large endeavour for technological up-gradation including energy conservation in small industries. Already some successes had been achieved.

The Government of India had established in the Ministry of Science and Technology, the Department of New Energy Sources (DNES) for promoting use of new energy sources during the VII Five Year Plan (1985-1990). The Department has a budget of US $400 million for developing technologies and demonstrating use of NRSE in different sectors of the economy. Solar energy use in the domestic and industrial sectors had made considerable progress. Use of passive solar water heaters was becoming widespread in houses and industry. Photovoltaics were being used for water pumping for irrigation, lighting in remote and rural areas and in specialized applications like, space, light houses etc. The Government established a Nodal agency, the National Energy Conservation Organization (NECO) to promote energy conservation activities in the country. India encouraged cooperation among developing countries for exchange of experience and information in this area.

---

*Prepared and presented by UNIDO Consultant.

B. NRSE (New & Renewable Sources of Energy)

PHILIPPINES

a) PNOC-ERDC

In line with the new PNOC-ERDC thrust, and the country's economic recovery programme, in general, attention was being given to applied research especially in energy conservation and management while continuing the development of promising alternative energy resources for possible future commercialization. The Philippines, like most developing countries, could not afford to invest in basic R&D and would therefore do adaptive and practical approaches in solving energy problems. The need for timely and dependable information could not be overemphasized. The following activities were suggested for strengthening information flow:

1. Increased attention to energy conservation and management for industries in terms of information exchange among participating countries on success stories. Existing information systems such as UNIDO's AEN could be tapped.

2. Support for the development of prompt communication network among participating countries.

3. Increased national activities towards better coordination on this level thus creating a stable foundation for regional cooperation.

4. Support for training and expert exchange on energy conservation and management.

b) NEA

The Paper gave a brief background of the National Electrification Administration (NEA) and the rural electrification programme in the Philippines. As of December 1986, 89% of the country had electricity. NEA's undertakings on two rural energy programmes, mini-hydro and the Dendro thermal development programme, to assist electric cooperatives to be self-sufficient in energy and to reduce the country's dependence on oil were described. At present 13 mini-hydro power plants with a total capacity of 14.4 MW were operational, 5 Dendro power plants were completed and commissioned with a total capacity of 15.7 MW and a total of 7,500 hectars tree plantations were developed.

The Paper cited NEA's involvement in three network activities which were the Regional Network for Small Hydropower (RN-SHP), the Bioenergy Users Network (BUN) and the Regional Rood Energy Development (RWED).

The Paper citied a number of suggestions to strengthen Asian cooperation in NRSE field and suggested practical UNIDO/UNESCO joint programmes/projects in NRSE field.

THAILAND

The present activities on the New and Renewable Sources of Energy in Thailand covered resource assessment, identification of needs, research and development, promotion and popularization programmes. Estimates of the potential had been made, and were being up-dated on biomass, agriculture waste, agriculture produce, fuel wood, charcoal, municipal waste, geothermal, oil shale, hydropower, solar energy and wind power. To help facilitate the development of NRSE resources, it was most important that the technologies were appropriate and cost effective. Cooperation among especially the

developing countries, and if necessary more developed countries especially on exchange of information, both on technology and hardware was desirable in order to speed up development. Joint efforts among developing countries in securing technologies from developed sources would also enhance development. It was believed that UNIDO/UNESCO could play an important role in this.

INDONESIA

In the case of Indonesia, the development and utilization of new and renewable sources of energy (NRSE) was viewed in the context of the national energy policy.

Resource assessment programme as well as technological assessment programme had been implemented as part of a plan to develop and utilize NRSE. Indonesia's renewable energy resources had great potential but would play an important role only if it could be technically and economically exploited. Small scale pilot projects had been implemented.

Rice husk gasification technology had a high potential for application to SMI's, e.g. rice milling industries, but at the initial stage of development of technology. A carefully planned scheme for its promotion and dissemination was necessary.

Information on renewable energy technologies as well as their use was needed to make NRSE more and more technically proven and reliable and cost competitive with conventional energy. Regional information networks such as INNERTAP and UNIDO/UNESCO joint programme could play an important role in providing the information support to national activities.

Practical programmes were appreciated to support the needs of information including the following:

- Training programmes - such programmes would primarily be aimed to handle information and strengthen linkage among different institutions.

- Information materials concerning the application of renewable energy technologies. Also information on the experience of developing countries had in the transfer of renewable energy technologies should be made more widely available, including case studies of specific experience.

- Exchange of experience and information through seminars and workshops where experts could discuss and review all aspects of individual renewable energy technologies developed and related industrial development, especially on the available technologies and their possibilities for small scale industries.

- Exhibitions of programme to promote the manufacturing and application of NRSE technologies for small industries.

PEOPLE'S REPUBLIC OF CHINA

This Paper elaborated the urgent needs of energy conservation for small and medium industries (SMIs) in China. There was a large gap between the energy production and energy consumption in Chinese SMIs. Many SMIs could get endough energy supply specially in the region where there was a lack of primary energy source. Energy conservation was a vital step to quick Chinese development. Some of the most important reasons which caused high energy consumption were illustrated.

The Chinese central Government as well as local Governments had paid much attention to energy conservation. SMI's energy conservation was implemented through economic, technical, administrative and legal measures. It had made much progress in many different enterprises and regions. Some effective ways of energy conservation in SMIs were also discussed in the Paper.

KOREA

The need of energy options especially for the countries scarce of conventional energy sources was real. The utilization of passive solar energy for the human comforts seemed to appear a long time ago as seen in an old Korean sytle house made out of rice straw, bamboo and clay. The scientific application of passive technology, however, had a few years of short history. The passive solar technology, which has higher economic feasibility over others, was now actively emerging now. In the past few years, the subject of passive heating had been the major area of concern in the region. More recently, however, other important issues such as retrofitting, passive cooling, optimized integration of conservation and passive solar, and daylighting have emerged as the areas of frequent discussions.

KIER, the sole R&D organization in solar energy technologies in the Republic of Korea, has accomplished significant results in passive building designs and actual demonstrations of experimental passive building. Listed below are areas of current interests of passive solar applications in the Republic of Korea.

. Single-family residential buildings

. Multi-family residential buildings: condominiums, town-houses, apartments, etc.

. Public and commercial-scale buildings: offices, schools, army buildings and structures, warehouses, factory buildings, etc.

. Free-standing greenhouses

As a result of such endeavour by KIER, passive solar buildings had been well received by the Korean public. The number of passive solar buildings in Korea was well over 1,500 (as of August 1986). In this Paper, broad aspects of present status of passive solar technology utilization in Korea were presented. With vigorous introduction of the passive technology to the public at large, the effective energy utilization was expected to make a significant contribution to the efforts of energy conservation for the region.

NEPAL

Nepal is facing severe energy constraints in the pursuit of its economic developments. Despite priorities accorded to energy sector, the level of energy consumption had remained one of the lowest (249 kg of DE) in the world. The average per capita consumption of commercial energy was estimated at 16 kg of oil equivalent in 1983/84.

The majority of the country's commercial energy needs (90.8%) was met through imported fossil fuels. Petroleum products were extensively used in almost every activity of the country's modern sector, and their importance had been increasing every year, mainly because of expansion of development programmes, promotion of a number of industrial and commercial establishments and increase on the number of automobiles.

Nepal's energy sector, thus, exhibited a chronic structural imbalance between demand and supply. The energysector displayed an almost total reliance on the country's least plentiful resources (forests) and imported fossil fuels, whereas the abundant domestic resources (hydro, solar, biogas, etc.) remained virtually unutilized. The situation called for time bound measures for a structural change in the energy use pattern.

The Seventh Five Year Plan (1985-1990) recognized the importance of bringing about structural balance between demand and supply of energy. It laid emphasis on executing programmes for increasing the supply of traditional fuels and conserving them. At the same time, attempts to substitute traditional as well as imported fuels with the unharnessed energy resources such as hydro-power, biogas, solar energy, etc. were called.

IV. DISCUSSION

The workshop discussed the country papers presented to know in detail activities that were being implemented in different countries of the region. It was noted that most countries had structures for energy conservation R&D institutions and Government departments for promoting NRSE technologies in small and medium scale industries and energy conservation. It was also noted that several demonstration plants had already been established to use NRSE. Some of the countries had institutions to provide consulting services and to organize training programmes in energy conservation. A matter of special interest was that some countries of the region were providing financial incentives to popularize equipment using NRSE. Sometimes the subsidy covered 100% of the cost of the equipment. The Workshop noted the activities of INNERTAP and AEN, and the plans of UNIDO to convert ASEAN Energy Information Network into Asia Industrial Energy Information Network (AEN). It was felt that there was increasing need for the existing networks to cooperate among themselves to make more effective information flows among the countries so that the actual users would have ready access to useful information in NRSE and energy conservation technologies and their use.

It was the strong opinion of the Workshop that in order to make information activities in the areas of NRSE and energy conservation more effective, there was need in most countries for greater Governmental support in terms of facilities, manpower and finance.

The Workshop discussed modern facilities available for information storage, retrieval and dissemination, and how such facilities could be utilized in developing countries to hasten the flow of relevant information to the users. The establishment of such modern systems and their operation were relativelyeasy and inexpensive and cost effective. It was therefore felt that time had come for developing countries in the Asia-Pacific Region to go in for such systems without any loss of time because only such systems were cost effective and economical in developing countries. The recommendations of the October 1986, Beijing meeting organized by UNESCO on information in the energy

area were discussed. It was strongly felt that at least in some countries of the region such a system should be established as a pilot activity and UNIDO should take the lead.

While discussing the existence of administrative and other structures for promoting conservation of energy and use of NRSE, the Workshop felt that exchange of experience among such institutions would be very useful. It was felt that there was a need for an early consultative meeting to discuss legal, organizational, financial and other aspects of such institutional structure so that the existing organizations could be benefited by exchanging information.

Another important matter that was discussed in the Workshop was the need for study tours to actually provide opportunities to countries of the Region to visit working installations, factories and discuss successes and failures with those actually involved. Such activity should be organized by UNIDO/UNESCO periodically to provide as many opportunities as possible for exchange of actual experience among countries of the Region.

V. ADOPTION OF THE REPORT

After detailed discussion the Workshop adopted the Report. The Workshop made a strong recommendation to UNIDO/UNESCO and the countries of the Region for early implementation of activities suggested at the Workshop.

VI. ACKNOWLEDGEMENTS

The Workshop expressed its deep appreciation of the efforts made by UNIDO and UNESCO for the organization of the Workshop and the Government of the Republic of Korea and the Korea Institute of Energy and Resources for providing excellent host facilities and thanked them.

ANNEXURE I

LIST OF PARTICIPANTS AND OBSERVERS

PARTICIPANTS

People's Republic of China

Mr. Zhao Yingfu
Division Chief of International Relations
Institute of Scientific and Technical
Information of China (ISTIC)
15 Fuxinglu, P.O. Box 3827
Beijing, People's Republic of China
tel: 464746 tlx: 20079 CN1

Mr. Qu Shuigen
Chief of Office of China - INNERTAP
Chongqing Branch of ISTIC
P.O. Box 2104
Chongqing, Sichuan
People's Republic of China
tel: 53170 tlx: 62128 CBIST CN1

Mr. Jiang Xi-nian
Director
Beijing Solar Energy Research Institute
No. 3 Hua Yuan Road, Haidian Beijing
People's Republic of China
tel: 2018887-239 Cable: Beijing 5174

Indonesia

Mr. Tangkas Roesad
Head, Directorate Program Development
Directorate General of Electric Power
and New Energy
Jl. Rasuna Said, Block X2, Kav. 07 & 08
Kuningan, Jakarta, Indonesia
tel: 516066 tlx: 62319 ENERGI IA

Mr. Irzal N. Chabtab
Head, Sub-directorate Energy Conservation
Directorate General of Electric Power
and New Energy
jl. Rasuna Said, Block X2, Kav. 07 & 08
Kuningan, Jakarta, Indonesia
tel: 516073, 516066 tlx: 62319 ENERGI IA

Republic of Korea

Dr. Ik Soo Choi
Acting President
Korea Institute of energy and Resources
71-2, Jang-dong, Jung-gu
Daejeon, Korea
tel: 8229701 tlx: KIEREL K45507

Dr. P Chungmoo Auh
Director, Solar Energy Department
Korea Institute of Energy and Resources
71-2, Jang-dong, Jung-gu
Daejeon, Korea
tel: 8229701 tlx: KIEREL K45507

Malaysia

Mr. Letchumanan Ramatha
Assistant Secretary
Ministry of Energy, Telecommunications
and Posts
Wisma Damansara, Jalan Semantan
50668 Kuala Lumpur, Malaysia
tel: 2546677 tlx: ENTEP MA 30777

Nepal

Mr. Deepak Poudyal
Chief, Library and Documentatin Centre
Royal Nepal Academy of Science & Technology
New Baneswar, Kathmandu, Nepal
tel: 215316 tlx: NP 2361

Philippines

Mr. Rogelio A. Aldover
Department Head
Program Management & Information Department
PNOC-ERDC
P.O. Box 1031 MCC
Makati, Metro Manila, Philippines
tel: 977611 tlx: 22259 PNO PH

Mr. Charlie Quirante
Senior Mechanical/Electrical Engineer
Office of the President of the Philippines
Office of energy Affairs
Merrit Road, Fort Bonifacio
Makti, Metro Manila, Philippines
tel: 877633 tlx: 22666 EDC PH

Mr. Jaime C. Ner, Jr.
Division Manager, Engineering Division
Dendro Thermal Development Office
National Electrification Administration
4th Floor D&E Building, Quezon Ave.
Quezon City, Philippines
tel: 986556

Thailand

Dr. Prathes Sutabutr
Deputy Secretary-General
National Energy Administration
Kasatsuk Bridge, Yodse
Bangkok 10500, Thailand
tel: 2239322 tlx: 20524 NATENAD TH

Mr. Mohar Singh Monga
Director
Energy Policy and Planning Division
National Energy Administration
Yosse, Kasatsuk Bridge, Rama I Road
Bangkok 10500, Thailand

UN Organizations

UNIDO

Dr. H.W. Pack
Senior Officer
UNIDO
P.O. Box 300
A-1400 Vienna, Austria
tel: 26313723 tlx: 1356121

Prof. C.V.S. Ratnam
Managing Director
C.V.S. Ratnam and Associates (P) Ltd.
Industry, Management and Technology Consultants
10, 12th Main Road, Malleswaram West
Bangalore - 560 055, India
tel: 342694 tlx: 0854-2075 AIRD IN

UNESCO

Dr. Upali S. Kuruppu
Program Specialist in Science and Technology
UNESCO-ROSTSEA
Jl. M.H. Thamrin 14
Tromolpos 273/JKT
Jakarta, Indonesia
tel: 321308 tlx: UNDEVPRO 011-44178

Ms. Delia E. Torrijos
Advisor for the General Information Programme
UNESCO Principal Regional Office
UNESCO Annex
24/1 Soi 59 Sukhumvit Road
Bangkok 10110, Thailand
tel: 3811347 tlx: 20591

OBSERVERS

Dr. Jee Dong Kim	Research Fellow Korea Institute of Energy and Resources
Mr. P.E. Myoung Jae Cho	Director Energy Equipment Department Korea Institute of Energy and Resources
Mr. Young Mok Son	Director Energy Conversion Department Korea Institute of Energy and Resources
Dr. Hun S. Chung	Head Materials Research Laboratory Energy Conversation Technology Centre Korea Institute of Energy and Resources
Mr. Hee Sung Shin	Head Energy Conservation Analysis Laboratory Energy Conservation Technology Center Korea Institute of Energy and Resources
Mr. Dong Chan Kim	Head Fuel Research Laboratory Energy Conversion Department Korea Institute of Energy and Resources
Dr. Jin Soo Song	Head Photovoltaics Research Laboratory Solar Energy Department Korea Institute of Energy and Resources
Dr. Chong Joon Hong	Head Biomass Research Laboratory Solar Energy Department Korea Institute of Energy and Resources

Mr. Young Hi Chea
Head
Solar Energy Application Laboratory
Solar Energy Department
Korea Institute of Energy and Resources

Dr. Hong S. Jeon
Senior Researcher
Passive Solar Energy Laboratory
Solar Energy Department
Korea Institute of Energy and Resources

Dr. Je In Yoo
Senior Researcher
Active Solar Energy Laboratory
Solar Energy Department
Korea Institute of Energy and Resources

Dr. Kyu Hyun Lee
Head
Fluid Mechanics Laboratory
Energy Conversion Department
Korea Institute of Energy and Resources

Mr. Duk Yung Jung
Head
Technical Information Center
Korea Institute of Energy and Resources

Mr. Dai Ho Seo
Head
Resources Research Part
Korea Institute of Energy and Resources

Mr. Soo-Kil Yoon
Director-General
Resources Development Bureau
Ministry of Energy and Resources
The 2nd Government Building
Gwacheon, Korea
tel: (02)5039632 tlx: MERROK K23472

Mr. Chi-Moon Kim
Research Coordinator
Energy and Resources Technology
Ministry of Science and Technology
The 2nd Government Building
Gwacheon, Korea
tel: (02)5037636 tlx: MERROK K23472

Mr. Eun Kyu Kim
Deputy Director
Alternative Energy Division
Ministry of Energy and Resources
The 2nd Government Building
Gwacheon, Korea
tel: (02)503- tlx: MERROK K23472

Mr. P.E. Eun Shick Kim

Director, Daejeon Office
Korea Institute for Economics & Technology
1-13, Moonwha-dong, Jung-gu
Daejeon, Korea
tel: (042)233050

Mr. Ke Hong Park

Chief Librarian
The Library
Korea Advanced Institute of Science
and Technology (KAIST)
P.O. Box 150, Cheongryang
Seoul, Korea
tel: 9661931 tlx: KISTROK K27380

Mr. Young Koo Lee

Korea Energy Economics Institute (KEI)
C.P.O. Box 4311
Seoul, Korea
tel: (02)2450106 tlx: KCPAD K32354

Mr. U. Yearn Kim

Chief
Science Section
The Korean National Commission for UNESCO
P.O. Box Central 64
Seoul, Korea
tel: (02)7762671

Mr. Shi Yohl Park

UNIDO-IPS Seoul Office
Seoul, Korea

Dr. Jong Seung Paik

Head
Force and Fluid Flow Laboratory
Korea Standard Research Institute (KSRI)
P.O. Box 8 Daejeon
Daejeon, Korea
tel: (012)8227201 tlx: KOSRI K 45534

Mr. Tae Hwan Kim

Head
Technical Information Center
Korean Atomic Energy Research Institute
(KAERI)
Daejeon, Korea

Dr. Ji Wun Yang

Professor
Korea Institute of Technology (KIT)
400, Goosung-dong, Jung-gu
Daejeon, Korea
tel: (042)8231234

Mr. Chang Keun Kim
Chief Librarian
Library
Korea Institute of Technology (KIT)
400, Goosung-dong, Jung-gu
Daejeon, Korea
tel: (042)8231234

Mr. Jong Bun Choi
Director
Civil and Architecture Department
Research Centre
Korea Electric Power Corporation (KEPCO)
73-1, In-dong, Dong-gu
Daejeon, Korea
tel: (042)2503200 tlx: KEPCORC K45531

Mr. Kyn Sio Shin
Director
Chemistry and Environment Department
Research Center
Korea Electric Power Corporation (KEPCO)
73-1, In-dong, Dong-gu
Daejeon, Korea
tel: (042)2503200 tlx: KEPCORC K455311

Mr. Byung Sun Choi
Head
Research Centre
Korea Electric Power Corporation (KEPCO)
Daejeon, Korea
tel: (042)2503200 tlx: KEPCORC K455311

Mr. Dal Young Park
Manager
Technology Development Division
Korea Gas Corporation (KGC)
Seoul, Korea
tel: (02)7838371

Mr. Myong Ho Lee
President
Society of Solar Energy of Korea
Seoul, Korea

Dr. Young Il Mok
Professor
Ajou University
San 5, Wonchun-dong
Suwon, Korea
tel: (0331)335141

Dr. Too Young Lee
Professor
Chung Aug University
121, Huksuk-1 dong, Dongjak-gu
Seoul, Korea
tel: (02)8133811

Dr. Sang Gon Lee
Professor
Inha University
253, Yonghyun-dong, Nam-gu
Incheon, Korea
tel: (032)8620077

Dr. Jae Ou Chae
Professor
Iha University
253, Yonghyun-dong, Nam-gu
Incheon, Korea
tel: (032)8620077

Dr. Hyun Chai Jung
Professor
Kyung-Hee University
1, Hoegi-dong, Dongdaemuun-gu
Seoul, Korea
tel: (02)9660061

Dr. Tai Soo Chung
Professor
Sungkyunkwan University
Seoul, Korea

Mr. Jin Koo Kim
KEMKO

Mr. Young Il Kang
Korea Electronics and Telecommunications
Research Institute (KETRI)

Dr. Dong Ryul Shin
Korea Institute of Energy and Resources
71-2, Jang-dong, Jung-gu
Daejeon, Korea
tel: (042)8229701 tlx: KIEREL K45507

Mr. Young Ihli Kim
Chief of Fossil Fuel Laboratory
Korea Institute of Energy and Resources
71-2, Jang-dong, Jung-gu
Daejeon, Korea
tel: (042)8229701 tlx: KIEREL K45507

Mr. W.S. Shu

Korea Institute of Energy and Resources
71-2, Jang-dong, Jung-gu
Daejeon, Korea
tel: (042)8229701 tlx: KIEREL K45507

Mr. Pyung Sam Ji

Manager, New Energy Section
Researc Center
Korea Electric Power Corporation (KEPCO)
73-1, In-dong, Dong-gu
Daejeon, Korea
tel: (042)2503200 tlx: KEPCORC K45531

Mr. Soo Ock Chung

Alternative Energy Officer
Alternative Energy Division
Ministry of Energy and Resources
The 2nd Government Building
Gwacheon, Korea
tel: (02)5039634 tlx: MERROK K23472

Annexure II

WORK PROGRAMME

Monday, 26 October 1987

9:00 - 10:00	Registration
10:00 - 11:00	Opening Ceremony Welcoming Address by Acting President of KIER Address by MOER Representative Address by MOST Representative Address by UNIDO Representative Address by UNESCO Representive Election of Chairman and Rapporteur
11:15 - 12:30	Introduction of Information Network on New and Renewable Energy Resources and Technologies for Asia and the Pacific (INNERTAP) by UNESCO Introduction of Asia Industrial Energy Information Network (AEN) byUNIDO
14:00 - 16:00	Participants Paper presentation on Energy Conservation on SMI with case studies by AEN Members . Philippines, by Mr. Charlie Quirante . China, by Mr. Zhao Yingfu and Mr. Jiang Xinian . Thailand, by Dr. Prathes Sutabutr
16:15 - 18:00	Presentation (continued) . Malaysia, by Mr. Letchumanan Ramatha . Indonesia, by Mr. Irzal Nur Chatab . Korea, by Dr. Soo H. Choi . India, by Dr. C.V.S. Ratnam

Tuesday, 27 October 1987

9:00 - 10:50	Participants Paper presentation on NRSE with Case Studies by INNERTAP Members . Philippines, by Mr. Rogelio Z. Aldover . Philippines, by Mr. Jaime Ner, Jr. . Thailand, by Mr. Mohar Singh Monga
11:10 - 12:30	Report Presentation (continued) . Indonesia, by Mr. Tankas Roesad . Korea, by Dr. Paul C. Auh
14:00 - 16:00	Ways and Means of Co-operation and Co-ordination among the INNERTAP and AEN Members
16:15 - 18:00	Formulation of Joint Work Program between INNERTAP and AEN

Wednesday, 28 October 1987

9:00 - 10:45	Adoption of Joint Work Programmes and Reports
11:00 - 12:00	Adoption of Joint Work Programmes and Reports (continued)
12:00 - 13:30	Closing ceremony
13:30 - 18:00	Visit KIER and Daeduck Science Town

Annexure III

LIST OF DOCUMENTS AND COUNTRY REPORTS

1. Aide-Memoire

2. Energy Conservation in the Philippines, by Mr. Charlie Quirante

   Feasibility Studies on Cogeneration in the Philippine Industrial and Commercial Sectors, by Mr. Manuel L. Soriano

3. Energy Conservation in Small and Medium Industries (SMIs) of China, by Mr. Jiang Xinian and Mr. Zhao Yingfu

4. Industrial Energy Conservation in Thailand, by Dr. Prathes Sutabutr

5. Energy Conservation in Malaysian Industries, by Mr. Letchumanan Ramatha

6. Present Status of Energy Conservation in Indonesia, by Mr. Irzal Nur Chatab

7. Energy Conservation Efforts in the Republic of Korea, by Dr. Soo H. Choi

8. Case Studies in Energy Conservation and Use of New and Renewable Energy Sources in Small and Medium Scale Industries in India, by Dr. C.V.S. Ratnam

9. Application of Renewable Energy Technologies and Energy Conservation to Small and Medium Scale Industries in the Philippines, by Mr. Rogelio Z. Aldover

10. New and Renewable Sources of Energy in the Philippines, by Mr. Jaime C. Ner, Jr.

11. New and Renewable Sources of Energy Activities in Thailand, by Mr. Mohar Singh Monga

12. The Development of New and Renewable Sources in Indonesia, by Mr. Tangkas Roesad

13. The Potential and Ways of Energy Conservation in China's Township Enterprises, by Mr. Qu Shuigen

14. Passive Solar Buildings in the Republic of Korea, by Dr. P. Chungmoo Auh

15. Renewable Energy Resources in Nepal by Mr. Deepak Poudyal